westward), and somewhat flatten the curved paths with the wind; but it would not probably affect materially the general explanation above.

"H. D. G." truly observes that, owing to the curvature of the earth, his station was nearly 2000 feet below the horizontal line of Spithead, but this also would not materially alter our explanation.

So far for the sound heard at distant stations not very far from the east-west line from Spithead. When, however, we come to consider the case of Oxford and other places nearly due north, where the sound was heard, and in particular the duration of continuous sound (20 seconds) and succession of sounds and silences noted by Sir W. J. Herschel, our explanation entirely fails. It is true that the differences of distance from Oxford to the different ships were so small that the impulses from all the forty-six ships must have arrived within the interval of about half a second, but they would have diminished in intensity (according to the law of the inverse square of the distance, which in the absence of wind in their direction must be assumed) so as to be less strong than the impulse from a single gun at the distance of ten miles, a distance at which, we have seen, it would have been inaudible.

Was there a southerly current in the upper atmosphere between the Solent and Oxford? Or was the state of the atmosphere abnormal as to temperature, so that the upper regions were warmer than the lower, as hardly seems probable? Or, lastly, were the sounds heard by Sir W. J. Herschel diffraction effects outside the upward curving sound rays, as the intervals of sound and silence seem to suggest? Or is any other explanation possible from known laws?

Possibly some light may be thrown on these questions by other correspondents, or such experts as Sir G. Stokes, Lord Rayleigh or Prof. Osborne Reynolds.

The Cherbourg Peninsula at its northern end is about the same distance to the south of Spithead as Oxford to the north. It would be interesting to know if the sounds were heard by ships in the channel between the Isle of Wight and Cherbourg.

ROBT. B. HAYWARD.

Ashcombe, Shanklin, March 12.

The New Star in Perseus.

IN sending you a provisional light-curve of Dr. Anderson's new star for publication in NATURE, my principal purpose has been to ascertain the nature of the curious fluctuations in the latter part of its course. I have no doubt that they are real, as even the slight irregularity in the descending curve, about March 5, has been independently detected in Leyden, and probably elsewhere also; but the periodicity that seems to establish itself in the past six or seven days may be only apparent. In this country the weather has been generally unfavourable for some weeks, and it is possible that astronomers in other parts of the world will be able to fill the gaps between the observed parts of the descending curve (on February 25, March 1, 3, 5, 6, 13, 17, 20, 21, 22, 23, 25, 27).

This star is remarkable in still another respect. It is a well-known fact that new stars have almost exclusively made their appearance in the Milky Way; moreover, it has been pointed out recently by Sir Norman Lockyer in this journal that the Novæ are not equally distributed along the galactic zone; like the "Wolf-Rayet" stars, they seem to avoid the region comprised between Cassiopeia and Carina. Nova Persei 1901 is no exception to the general rule, it being situated on a feeble distance of the central plane of the Milky Way, but as in the case with the other new star discovered by Dr. Anderson, in Auriga, it lies in a relatively poor region of the galactic zone, in which phenomena of this kind have but rarely occurred. Notwithstanding this, I think that the tendency among the new stars to group themselves in the opposite region of the Milky Way holds good as a rule.

C. EASTON.

Rotterdam, March 27.

NOVA PERSEI.

THE observations of the new star in Perseus have not decreased in interest since they were last referred to in NATURE. Strictly according to precedent a nebular spectrum, somewhat similar to that observed by Gothard in Nova Aurigæ, followed the disappearance of the dark lines in the spectrum; but about the same time a new phenomenon in relation to Nova was observed; the star behaved like a "collision-variable."

Sudden changes of magnitude have been one of the most interesting features of this new star. Since the time (February 23) that the Nova attained its greatest brilliancy, the star gradually diminished in brightness, decreasing rather rapidly till the 13th March, and somewhat more slowly up to the 17th. Since this date periodical variations have occurred, the star decreasing to a 5·5 magnitude star and rising to about 4·2 in a period of three days (about). Thus minima were observed on March 19, 22, 25 and 28. On the evenings of the 30th, 31st and April 1 the star was of mag. 4·2, 4·3, 4·4, so that either another minimum had occurred between the times at which these observations were made or the periodicity is undergoing a change. It is important, therefore, that the light of the Nova should be observed as often as possible, so that such changes may be accurately determined.

Whether this result is due to the complete capture of the denser swarm or to other changes brought about in the sparser one, it is as yet impossible to say.

We append some extracts from a paper communicated to the Royal Society by Sir Norman Lockyer last Thursday.

Colour.—The colour has undergone some distinct changes since the observation on March 5 last, when it was shining with a clarety-red hue. On the 9th and 10th it was observed to be much redder, due probably to the great development of the red C line of hydrogen.

On the 23rd and 24th the star was noted as yellowish-red, while on the 25th (after the sudden drop in magnitude) it was very red with perhaps a yellow tinge.

Since that date the star has again become much less red than formerly, and on April 1 was distinctly yellow with a reddish tinge.

The Visual Spectrum.—Since March 5 the spectrum has become much fainter, the bright lines of hydrogen being relatively more prominent than they were before; indeed, C and F throughout this period have been the most conspicuous lines, especially the former, while the bright lines $\lambda\lambda$ 5169, 5018 and 4924, and the line in the yellow at or near D, were the most prominent of the others.

All these lines have been gradually becoming weaker, but there is an indication that λ 5018 has been brightening relatively to λ 5169.

Accompanying the great diminution in the light of the Nova observed on the evening of the 25th, the spectrum was found to have undergone a great change: the continuous spectrum had practically disappeared, and a line near D (probably helium D^3) became more distinct. The other lines were hardly visible.

The Photographic Spectrum.—The spectral changes recorded in the photograph in one part of the spectrum follow suit with those observed visually in the other.

On March 6 the photograph was very similar to those obtained in the earlier stages, the only apparent difference being in the relative intensity of the bright hydrogen lines as opposed to those having other origins, most of which have been shown to be probably due to iron and calcium. The hydrogen lines have sensibly brightened, while the others have become much feebler.

The photograph of March 10 shows a further dimming of the bright lines other than those of hydrogen.

On March 25, when the next good photograph was taken, the spectrum had undergone great modifications. The hydrogen lines are still very bright, though they do not show the structure which they did in the photographs taken between February 25 and March 10. The bright lines other than those of hydrogen which are seen in the earlier photographs have now disappeared and other lines become visible. The continuous spectrum has also greatly diminished.

Rough determinations of the wave-length of these new lines have been made by Mr. Baxandall by interpolation between the hydrogen lines. They are as follows:—

387. Broad and merging into Hζ (3889).
436. Faint.
447. Not very strong. Probably Helium (λ4471·6).

456. Faint.
464. Very strong broad line. Possibly the 465 line of the bright-line stars.
468. Moderately strong. Possibly new hydrogen (λ 4686) seen in bright line stars.
471. Weak. Probably helium (λ 4713).

The hydrogen lines in the spectra are Hζ, Hϵ, Hδ, Hγ and Hβ.

The lines at λ 370 and 464 are perhaps identical with those observed by von Gothard[1] in the spectrum of Nova Aurigæ, after it had become nebular, but associated with these lines in his record there is the chief nebular line at 5006, no trace of which is yet visible in the spectrum of Nova Persei. On the other hand, Hβ, which is the brightest line in the present spectrum of Nova Persei, does not appear at all in von Gothard's spectrum of Nova Aurigæ.

Characteristics of the Hydrogen Lines.—A detailed examination of the lines as photographed on several evenings shows that their structure has been undergoing changes. On February 25 there were three points of maximum luminosity on the F line, the two maxima on the blue side being of equal intensity and greater than the third on the red side. By March 1 the centre one had greatly been reduced in magnitude, and on the 3rd it had been broken up into two portions, thus making four distinct maxima.

Rough measures made on the relative positions of these points of maxima show that the difference of velocity indicated between the two external maxima is nearly 1000 miles per second, while that between the two inner maxima is 200 per second. We thus have indications of possible rotations or spiral movements of two distinct sets of particles travelling with velocities of 500 and 100 miles per second.

A similar examination of the F and G lines of hydrogen in the photographs obtained with the 30-inch reflector has also been made by Dr. Lockyer. In this longer series the most important fact comes out that the change of maximum intensity changes from the more to the less refrangible side of the bright hydrogen line,[2] and the narrowing of the bright maximum in the middle.

So far as the observations have gone they strongly support, in my opinion, the view I put forward in 1877, that new stars are produced by the clash of meteor swarms. I have suggested some further tests of its validity.

We may hope, since observations were made at Harvard and Potsdam very near the epoch of maximum brilliancy, that a subsequent complete discussion of the results obtained will very largely increase our knowledge. The interesting question arises whether we may not regard the changes in spectra as indicating that the very violent intrusion of the denser swarm has been followed by its dissipation, and that its passage has produced movements in the sparser swarm which may eventuate in a subsequent condensation.

THE BEER POISONING EPIDEMIC.

THERE is now a pause in the literature of the most interesting, but at the same time most disastrous, beer poisoning epidemic, and the present seems a fitting opportunity to summarise the chief facts ascertained with regard to it, the deductions to be drawn from them, and, last but not least, the lessons which they teach so far as concerns the prevention of a recurrence of the calamity.

The first fact of transcendental importance was ascertained by Dr. Reynolds, namely, that the beer consumed by these unhappy individuals contained arsenic in such an amount as undoubtedly in many cases to account for the symptoms from which they suffered. So far as subsequent workers are concerned, their results have amply confirmed this fact, and there can be no doubt that the majority of patients in Manchester suffered from what has always been called arsenical poisoning. The next step was directed to ascertain how the arsenic got into the beer. Of this, fortunately, there can be no doubt it came into the beer from the sugar, and it got into the sugar through the sulphuric acid used either directly or indirectly in the manufacture of the invert sugar or the glucose. It is beside our purpose here to discuss whether all the cases of poisoning were due to the use of sugar made from sulphuric acid supplied either by one firm or prepared from one variety of pyrites. This, although a matter of paramount importance, is not essentially a matter for the man of science to decide. A definite answer to this question can only be obtained by the careful sifting of evidence, the examination of the books of various firms, &c., and is, indeed, a matter for the lawyer rather than for the chemist or pharmacologist. There can be no doubt, however, that the majority of cases observed could be traced to the consumption of beer and stout in the preparation of which sulphuric acid, supplied since the spring by one firm, had been used.

The next actual fact with regard to the causation of the epidemic was, unfortunately, discovered too late to allow of its full significance being thoroughly worked out. Two full months after the consumption of arsenicated beer had ceased, Dr. Tunnicliffe and Dr. Rosenheim demonstrated the presence in relatively large quantities (0·3 per cent.) of selenious acid in the sulphuric acid which was used in the preparation of the invert sugar supplied by the firm implicated in the recent epidemic. These observers subsequently further demonstrated the presence of this substance, which was, indeed, from their earlier work *a priori* almost certain, in the invert sugar itself and also in two different samples of beer identical with that consumed by the poisoned patients in Salford. They also pointed out at the same time that this substance is highly poisonous, certainly as, if not more, poisonous than arsenic, giving rise to symptoms almost identical with this latter poison. Exact quantitative estimations of the amount of selenium in the beer are, so far as we are aware, not yet published, but reckoning from the acid and the sugar we may calculate that this substance was present to the extent of about one quarter the amount of the arsenic present. It follows, then, that the beer consumed in the recent epidemic contained at least two poisonous substances, viz., arsenic and selenium, both of which got into the beer from the sulphuric acid used in the preparation of the sugar.

So far as concerns the actual ætiology of the epidemic, the above are all the facts which we have at present in our possession. Incidentally, however, numerous other points of extreme interest to the physician, the pharmacologist and toxicologist have arisen in the course of the inquiry.

So far as the pharmacology of arsenic is concerned, it is greatly to be regretted that our information concerning the exact amount of arsenic consumed by the individual patients is so inaccurate. This inaccuracy arises from two conditions. Firstly, it has not been in all cases absolutely established that the beer quantitatively examined for arsenic, although coming from the same source as, was identical with that consumed by the respective patients; secondly, the actual amount of beer taken by each patient was in many cases an unknown quantity. The largest amount of arsenious acid found in beer during the epidemic was 1·4 grains per gallon. Some of the sufferers undoubtedly consumed more than a gallon of beer per diem; some, however, did not consume more than a pint. This would mean that, although the former received a highly poisonous dose of arsenic, the latter would do so only in the cases of the very highly arsenicated beers, which were relatively rare. If we assume that arsenic was the only poisonous agent at work, we must also admit that it caused grave poisoning in very minute doses; in some cases, from the published records, these must have been as small as 1/200th of a grain per diem.

[1] *Ast. Phys. Journ.* vol. xii. p. 51, 1895.
[2] The latest photograph, taken on April 1 shows this peculiarity in a far more pronounced manner, the intensity of the less refrangible component of the hydrogen lines being more than four times that of the more refrangible component.